

**UNITED STATES DEPARTMENT OF COMMERCE****United States Patent and Trademark Office**

Address: COMMISSIONER OF PATENTS AND TRADEMARKS  
Washington, D.C. 20231

*AS*

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.
-----------------	-------------	----------------------	---------------------

09/357,264 07/19/99 ZHANG

F 30-4790 (4780)

EXAMINER

IM22/0809

LESLIE WEISE  
ALLIEDSIGNAL INC  
P O BOX 2245  
101 COLUMBIA ROAD  
MORRISTOWN NJ 07962-2245

BROWN, C

ART UNIT

PAPER NUMBER

1765

DATE MAILED:

08/09/01

Please find below and/or attached an Office communication concerning this application or proceeding.

Commissioner of Patents and Trademarks

# Office Action Summary

Application No.  
09/357,264

Applicant(s)  
Zhang et al.

Examiner  
Charlotte A. Brown

Art Unit  
1765



-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

## Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136 (a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

## Status

- 1) ☒ Responsive to communication(s) filed on May 30, 2001
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11; 453 O.G. 213.

## Disposition of Claims

- 4) ☒ Claim(s) 1 and 12-33 is/are pending in the application.
- 4a) Of the above, claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1 and 12-33 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claims \_\_\_\_\_ are subject to restriction and/or election requirement.

## Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are objected to by the Examiner.
- 11) ☐ The proposed drawing correction filed on \_\_\_\_\_ is: a) ☐ approved b) ☐ disapproved.
- 12) ☐ The oath or declaration is objected to by the Examiner.

## Priority under 35 U.S.C. § 119

- 13) ☐ Acknowledgement is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d).
- a) ☐ All b) ☐ Some\* c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
  - ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_
  - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\*See the attached detailed Office action for a list of the certified copies not received.

- 14) ☐ Acknowledgement is made of a claim for domestic priority under 35 U.S.C. § 119(e).

## Attachment(s)

- 15) ☐ Notice of References Cited (PTO-892)
- 16) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 17) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s). \_\_\_\_\_
- 18) ☐ Interview Summary (PTO-413) Paper No(s). \_\_\_\_\_
- 19) ☐ Notice of Informal Patent Application (PTO-152)
- 20) ☐ Other:

Art Unit: 1765

### DETAILED ACTION

1. Applicant's arguments with respect to claims 1 and 12-33 have been considered but are moot in view of the new ground(s) of rejection.
2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.
3. Claims 1 and 12-18 are rejected under 35 U.S.C. 103(a) as being unpatentable over Indira et al. "Chemical Polishing of Metals : A Study" pp 80-91 in view of Kaufman et al. (US 6,063,306).

Indira discloses a chemical polishing solution for polishing the surface of a copper alloy. The chemical polishing solution contains 30 ml of nitric acid which is an oxidizing reactant. It contains 50 ml of acetic acid which is a co-reactant. It also contains 10 ml of hydrochloric acid which is an additive. It would have been obvious to one skilled in the art at the time of the claimed invention to use any one or a combination of the conventional processes (polishing, chemical-mechanical polishing, or etching) to polish the surface of the metal.

Unlike the claimed invention, Indira does not teach a method for using a planarizing system that includes a Cu/Ta/TaN surface.

Art Unit: 1765

Kaufman discloses a method for using a polishing slurry to polish a substrate containing copper and containing tantalum or tantalum nitride or both tantalum and tantalum nitride. The terms copper and cooper containing alloys are used interchangeably. The terms include but are not limited to substrates comprising layers of pure copper, copper aluminum alloys, and Ti/TiN/Cu, and Ta/TaN/Cu multi-layer substrates (Column 4, lines 37-42).

It is the Examiner's position that a person having ordinary skill in the art would have found it obvious to modify Indira with the method of using a Cu/Ta/TaN surface as taught by Kaufman therein because Indira is not particular about the cooper alloy surface used in his process and therefore any copper alloy would have been anticipated in order to produce an expected result.

4. Claims 19-33 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kaufman (US 6,063,306).

Kaufman teaches a method for using a CMP slurry for polishing a substrate containing copper and tantalum or tantalum nitride or both tantalum and tantalum nitride. The slurry includes at least one oxidizing agent. The preferred oxidizing agents are urea and hydrogen peroxide (Column 5, lines 25-30). A complexing agent is used. The complexing agent can include either acetic acid or phosphoric acid (Column 5, lines 60-65). The pH of the slurry is maintained by using a base that contains no metal ions such as nitric acid (Column 7, lines 18-22). Phosphoric

Art Unit: 1765

and sulfuric acid can also be used. Other additives may be incorporated into the CMP slurry to include or enhance the polishing rate of the barrier layers in the wafer. Useful inorganic additives include hydrofluoric acid (HF) (Column 10, lines 52-60). The slurry is formulated so that it exhibits a low polishing rate towards the copper and typical polishing rate towards tantalum or tantalum nitride.

Unlike the claimed process, Kaufman does not require that the copper and at least one of the Ta and TaN are planarized in a single processing step. He teaches that when then the slurry is applied to the surface it exhibits a low polishing rate towards toward the copper and a typical polishing rate towards the tantalum and tantalum nitride. It is the Examiner's position that a person having ordinary skill in the art would have found it obvious to modify Kaufman by using a single processing step in order to increase the removal rate of copper and tantalum or tantalum nitride which would result in a removal rate selectivity of 1:1.

5. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after

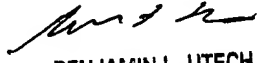
Art Unit: 1765

the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

6. Any inquiry concerning this communication from the Examiner should be directed to Charlotte A. Brown whose telephone number is (703) 305-0727.

CAB

August 8, 2001

  
BENJAMIN L. UTECH  
SUPERVISORY PATENT EXAMINER  
TECHNOLOGY CENTER 1700